

The Linux Boot Process

What You Will Learn

- BIOS
- Boot loaders
- Linux Kernel
- Runlevels

BIOS

- Basic Input/Output System
- Special firmware
- It's operating system independent
 - This is not unique to the Linux OS
- Primary purpose is to find and execute the boot loader
- Performs the POST
 - Power-On Self Test

BIOS

- Knows about bootable devices
 - Hard drives
 - USB drives
 - DVD drives
 - etc.
- The boot device search order can be changed.

Boot Loaders

- LILO
 - Linux Loader
- GRUB
 - Grand Unified Bootloader
 - Replaced LILO
- Boot loaders start the operating system
- Boot loaders can start the operating system with different options

Initial RAM Disk

- initrd
 - initial RAM disk
- Temporary filesystem that is loaded from disk and stored in memory.
- Contains helpers and modules required to load the permanent OS file system.

The /boot Directory

- /boot
 - Contains the files required to boot Linux
 - initrd
 - kernel
 - boot loader configuration

```
$ ls -F /boot
```

```
abi-3.13.0-46-generic
```

```
initrd.img-3.13.0-46-generic
```

```
config-3.13.0-46-generic
```

```
System.map-3.13.0-46-generic
```

```
grub/
```

```
vmlinuz-3.13.0-46-generic
```

Kernel Ring Buffer

- Contains messages from the Linux kernel
- `dmesg`
- `/var/log/dmesg`

Runlevels / Description

0	Shuts down the system
1, S, s	Single user mode. Used for maintenance.
2	Multi-user mode with graphical interface. (Debian/Ubuntu)
3	Multi-user text mode (RedHat/CentOS)
4	Undefined
5	Multi-user mode with graphical interface. (RedHat/CentOS)
6	Reboot

Init

`/etc/inittab:`

`id:3:initdefault:`

- Being phased out by systemd.

Systemd

- Uses targets instead of runlevels.

```
# cd
/lib/systemd/system
# ls -l runlevel5.target
lrwxrwxrwx. 1 root root 16 Jul 17 2014
runlevel5.target -> graphical.target
# systemctl set-default graphical.target
```

Changing runlevels or targets

- **telinit RUNLEVEL**
 - `telinit 5`
- **systemctl isolate TARGET**
 - `systemctl isolate graphical.target`

Rebooting

```
# telinit 6  
# systemctl isolate reboot.target  
# reboot
```

Rebooting

```
shutdown [options] time [message]
```

```
# shutdown -r 15:30 "rebooting!"
```

```
# shutdown -r +5 "rebooting soon!"
```

```
# shutdown -r now
```

Poweroff

```
# telinit 0  
# systemctl isolate poweroff.target  
# poweroff
```

Summary

- BIOS
- Boot Loaders
 - LILO
 - GRUB
- /boot
- initrd
- vmlinuz or vmlinuz

Summary

- dmesg or /var/log/dmesg
- runlevels and targets
- telinit (init)
- systemctl (systemd)
- shutdown, reboot, poweroff